CLAIMS

1. A radio frequency amplifier module comprising a plurality of printed circuit boards laminated atop a bottom conductor plate, and including a radio frequency semiconductor amplifier chip mounted in a well extending through said boards in electrical connection therewith and electrically bonded atop said plate.

2. A module according to claim 1 wherein said chip includes top terminals electrically joined to one of said boards, and a metalized base directly bonded atop said plate.

3. A module according to claim 2 wherein said boards include input and output impedance matching circuits electrically joined to said chip.

4. A module according to claim 3 wherein said boards comprise a top board providing access to said well, and an intermediate board laminated between said top board and bottom plate, and said top board includes electronic components for said impedance matching circuits.

5. A module according to claim 4 wherein each of said boards further comprises a dielectric substrate and an integral metal layer, and said boards are sized in area for collectively providing printed circuits in said metal layers for operating said chip, including said impedance matching circuits therefor.

6. A module according to claim 5 wherein said metal layers include independent portions for providing radio frequency grounding for said module.

7. A module according to claim 5 wherein said printed circuits are interconnected between said metal layers by electrically conductive terminals

extending through said substrate therebetween.

8. A module according to claim 6 wherein said chip metalized base is an integral electrical ground for said chip, and said bottom plate is an electrical ground for said printed circuits electrically interconnecting said circuits and said chip base.

9. A module according to claim 5 wherein said boards further comprise a bottom board projecting into said well to define a ledge surrounding said chip, and said chip top terminals are electrically joined to said printed circuits atop said ledge.

10. A module according to claim 9 wherein said chip top terminals are electrically joined to said ledge by respective wires having length, diameter, and material property for effecting a predetermined inductance in said printed circuits.

11. A module according to claim 9 wherein said boards consist of three boards defining said well, with each of said boards defining a respective portion of said printed circuits.

12. A module according to claim 11 wherein said well includes a single chip configured for single band radio frequency operation, and said bottom plate includes five terminals electrically insulated therefrom and electrically joined to said printed circuits for inputting and outputting a radio frequency signal through said chip with impedance matching to external circuits.

13. A module according to claim 11 wherein said well includes a pair of said chips configured for dual band radio frequency operation, and said bottom plate includes corresponding sets of five terminals electrically insulated therefrom and

electrically joined to said printed circuits for inputting and outputting respective dual band radio frequency signals through said chips with impedance matching to external circuits.

14. A module according to claim 11 wherein said chip comprises Gallium Arsenide Heterojunction Bipolar Transistors, and said bottom plate underlies substantially all of said bottom board.

15. A module according to claim 5 further comprising a metal cover enclosing said top board and well for providing shielding for electromagnetic interference.

16. A module according to claim 15 further comprising metal sidewalls surrounding said laminated boards.

17. A module according to claim 16 wherein said metal cover, metal sidewalls, and metal bottom plate are electrically interconnected, and substantially enclose said laminated boards 18 and radio frequency chip.

18. A module according to claim 5 further comprising a metal top plate bonded to said top board to hermetically close said well and chip therein.

19. A module according to claim 18 wherein said top plate is electrically grounded to said bottom plate through said printed circuits.

20. A module according to claim 5 wherein said boards further comprise a cover electrically bonded to said top board atop said well to define a portion of said printed circuits.

21. A module according to claim 20 wherein said cover board also includes a

dielectric substrate and a printed circuit layer, and said printed circuit layer thereof comprises an additional electronic component for said impedance matching circuits.

22. A module according to claim 21 wherein said printed circuit layer of said cover board is disposed atop said substrate thereof.

23. A module according to claim 22 wherein said printed circuit layer of said cover board defines an inductor loop.

24. A module according to claim 23 wherein said cover board further includes a bottom metal layer covering said well and radio frequency chip therein.

25. A module according to claim 21 wherein said printed circuit layer of said cover board is disposed below said substrate thereof.

26. A module according to claim 25 wherein said additional electronic component is disposed inside said well suspended below the bottom metal layer of said cover board.

27. A module according to claim 26 wherein said cover board further includes a top metal layer disposed atop said substrate thereof.

28. A method of making said module according to claim 5 comprising:

fabricating each of said printed circuit boards with corresponding portions of said printed circuits thereon;

laminating together said boards and bottom plate into an integral assembly;

forming said well and ledge through said boards; and

assembling said chip and electronic components into said printed circuits.